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Beauty and the Bulls: The Investment Characteristics of Paintings

by Michael F. Bryan

This article examines the investment and consumption characteristics of the paintings market between 1971 and 1984, using the capital asset pricing model[1].

There are two principal motivations behind this research, Owners of paintings may be regarded both as consumers of aesthetics and as investors possessing a claim on future consumption. Since fine art prices increased in value by 11 percent per year on average between 1971 and 1984, and by 19 percent per year between 1977 and 1980, the investment character of the art market appears prominent and worth investigation.

Paintings and other "collectibles" belong to the durable goods class of commodities because they provide current consumption and claims on future consumption. In this sense, they differ little from automobiles or real estate. Insofar as durable goods yield a service flow to the owner over time, as opposed to the nominal income flow associated with financial assets, owners of durable assets are in some measure protected from unexpected inflation because the value of the service flow increases along with the general price level[2].

The nominal return on the durable asset, from the investment perspective, is inflation "hedged" in a way that returns from other investments (for example, stocks and bonds) are not? The analysis of the paintings market in this paper may provide additional insights to the performance of other durable goods markets during periods of inflation.

I. Measuring Fine Art Prices: The Sotheby's Index

The market for fine art operates in a capricious environment. Over short periods of time, auctioned art prices are subject to extreme market fluctuations. Art is often sold in groups, or "collections." The composition of a collection can vary considerably from one auction to the next, in terms of object types

1. *The original application of this model to paintings prices was done by Stein (1977) for the period 1946-1968.*

2. *For a more thorough analysis of the influence of inflation on asset returns, see Kantor (1983).*

3. *Another art market price index is constructed by Christie's Limited, also of London.*

(paintings, ceramics. furniture, etc.), in period (Renaissance. Impressionist. Modern. etc.), in reputation of the artist. and in condition of the object.

Reputation of the seller, rumors. "taste" swings, and auction location (London, New York. Hong Kong, Monaco, etc.) can also temporarily influence individual auction activity, further contributing to short-term price instability.

From the perspective of the art consumer. distinguishing temporary price movements from underlying appreciation is generally important only as a curiosity.

The pleasure received from the object over its life relative to its discounted purchase price need only be greater than that of other goods. Indeed, the product turnover in the art market has historically been quite low, and many art collections are sold only following the death of the owner.

This suggests that, from a historical perspective, the art market has been dominated by the aft lover and not by the investor. To the investor, however, the distinction between a temporary price fluctuation and asset appreciation in the marketplace is crucial. As investor interest in the art market intensified in the 1960s, financial analysts pressured art experts to measure underlying price appreciation In the fine art market. Like most price statistics, this information takes the form of an index.

One of the most popular art market price indexes is produced by Sotheby's auction house in London.[3] Essentially, the index does for fine art objects what the Consumer Price Index does for consumer goods and services.

The index represents a fixed basket of about 300 art objects categorized into 12 major components: Old Master paintings, Nineteenth Century European paintings, Impressionist and Post-Impressionist paintings, American paintings (1800 to pre-World War II), Modern paintings (1900–1950), English furniture, American furniture, Continental furniture, English silver. Continental silver. Chinese ceramics, and Continental ceramics.

A Sotheby's expert on each of the 12 components tracks auction prices. The expert then reappraises Sotheby's market basket objects on the basis of the recent price information. These valuation judgments, although highly subjective, attempt to filter out special or temporary influences from price data.

The major commodity components are weighted with respect to each component's share of combined sales by major New York and London auction houses during 1975, aggregated into a total art market index, and standardized at 1975 = 100.

For this analysis, an all-paintings index was constructed from four major paintings components in the Sotheby's index: Old Masters. Impressionist and Post-Impressionists, Nineteenth Century European paintings and drawings, and Modern Paintings (see appendix).

Table 1 Asset Return Correlations 1971–1984

	Paintings	Gold	Housing	Stocks	AAA bonds
Paintings	1.000				
Gold	0.666[a]	1.000			
Housing	0.321	0.477[b]	1.000		
Stocks	0.003	-0.213	0.204	1.000	
AAA bonds	0.336	0.243	0.307	-0.162	1.000

a. Significant at the 5 percent level of confidence.
b. Significant at the 10 percent level of confidence.

II. Recent Behavior of Paintings Appreciation

We begin by comparing the investment return on paintings with the return on alternative assets, including gold, housing, stocks, and bonds (table 1).

Over the period of analysis (1971–1984), inter-asset correlations reveal a strong positive

relationship between the rate of increase in the price of paintings and in the price of gold. The only other significant correlation was found between housing and gold price changes.

Thai the rate of return in the market for paintings correlates more closely with the market return on gold than with returns on financial assets (which are high in investment characteristics relative to consumption characteristics) or with returns on housing (which offers much greater consumption returns relative to financial assets) implies a rather. mixed personality.

Our first impression of the art market, therefore, seems to be one of an asset that fits neatly neither into the world of consumers nor the world of investors.

Since the investor interest in the fine paintings 'market is at least partially a function of the rate of inflation, we can test the sensitivity of paintings prices to changes in the general price level and to real growth in the U.S. economy (see appendix for results). The elasticity of paintings prices, with respect to real economic growth and the general price level. was significantly positive over the test period. The sensitivity of paintings prices to the general price level was near, but less than unity (elasticity = 0.96). while the real economic growth elasticity was stronger (elasticity = 1.35).

Despite the statistical strength of the estimates, the presence of serial correlation gives us reason to suspect that this simplistic specification obscures the underlying investment nature of the paintings market.

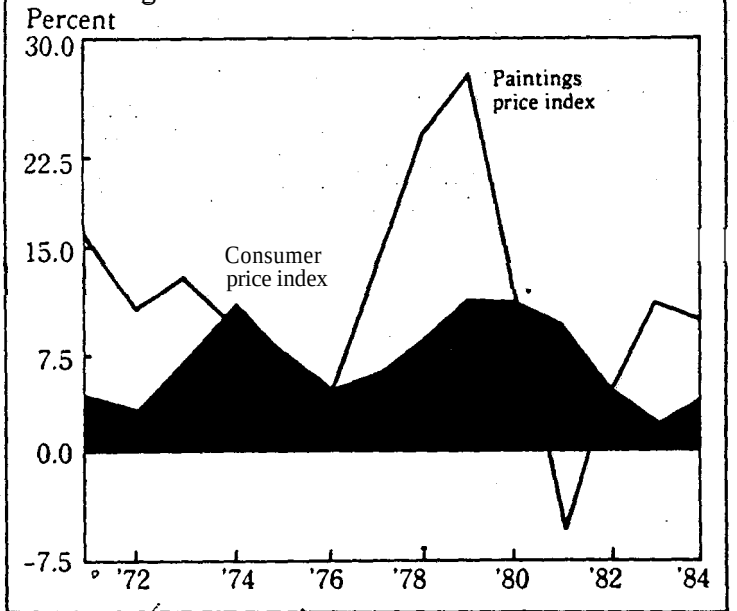
Figure 1 shows the behavior of the all-paintings index relative to the Consumer Price Index since 1970. Over the 15-year period, the rate of appreciation in paintings typically outpaced the rate of increase in the general price index. Howevei-, within short intervals (1973–1977 and 1980–1982), paintings price appreciation did not keep pace with inflation. During one year of inflationary pressure (1980–1981) paintings actually depreciated in value.

In short, while the rate of appreciation in paintings is positively related to the general price level, and moreover has outpaced inflation over the full period of analysis, its year-to-year performance has been considerably volatile.

In the language of the financial analyst, returns on paintings involve a degree of risk. One cursory measure of investment risk is the standard deviation of the investment return.

Table 2 compares the average annual rate of return and standard deviation in the paintings market between 1971 and 1984 against a sample of alternative investments. The rate of return in paintings was high over the sample period, relative to four major investment alternatives: gold, stocks, bonds, and housing. This contrasts with the finding of Anderson (1972) and Stein (1977) that demonstrated a rather weak return to paintings relative to other financial assets over earlier time horizons. Indeed, only investment in gold outperformed paintings over the sample period chosen here. The volatility of the art market return, however, also was above average, exceeded only by the volatility of gold and stock returns.

Fig. 1 The Rate of Return on Paintings Relative to Inflation



Within the paintings market basket. the investment return and volatility among major components was quite mixed. For example, Nineteenth Century European paintings fared much better during the period of analysis . than Old Master paintings (average return of 15.5 percent vs. 8.7 percent), and the former appeared to be only somewhat more risky (standard deviation of 15.6 percent vs. 12.7 percent). Moreover, the return on Impressionist and Post-Impressionist paintings was 10.3 percent, despite a comparatively low return standard deviation of only 7.1 percent.

III. Capital Asset Pricing Model

The casual analysis above merely places fine paintings price increases in perspective. Stanhard deviation estimates of return volatility are not very adequate measures of investment return risk, because they lack any theoretical underpinning.

To characterize nominal asset return behavior more formally, it is necessary to formulate an economic model of returns. Because paintings have dual personalities—being at once investment goods and consumer goods—their price behavior can be modeled from the consumer perspective, adjusting for investment characteristics (Anderson 1982 and Singer 1974), or modeled from the investment perspective, adjusting for consumption characteristics (Stein 1977).

The primary interest in this analysis is the investment side of paintings; consequently, the modeling approach chosen here takes the investment perspective and uses the capital asset pricing model (CAPM) represented. by equation (1).

$$(1) \quad (R^e_{a,t} - R_{f,t}) = \beta(R^e_{m,t} - R_{f,t}).$$

This time series application of a rather popular investment model, originally postulated by Black, Jensen, and Scholes (1972) and estimated by Stein (1977) for paintings prices over the period 1946,–1968, relates the expected nominal one-year rate of return on the relevant asset in time period t ($R_{a,t}$) in excess of a risk-free rate of return ($R_{f,t}$) as a function of the expected rate of return on a market portfolio ($R_{m,t}$) in excess of a risk-free rate of return. The estimated coefficient, β, represents the paintings market risk relative to the market portfolio risk—called ***relative systematic risk.***

For example, β estimates greater than 1 imply the relevant asset has proportionately greater risk than the market portfolio, and estimates less than 1 imply proportionately less risk than the market portfolio.

One may further visualize the expected return on paintings ($R^e_{a,t}$) as having two components: the expected return in consumption (viewing pleasure), $R^e_{c,t}$, and the expected investment return ($R^e_{i,t}$). More formally:

$$(2) \quad R^e_{a,t} = R^e_{c,t} + R^e_{i,t}.$$

Table 2 Pre-Tax Returns and Standard Deviations of Alternative Household Investments, 1970–1984 (annual rates)

Investment	Rate of return	Standard deviation
Gold	16.2	31.4
Paintings index	10.7	8.2
Stocks	8.4	19.4
One-year Treasury bonds	7.9	2.3
Market portfolio	7.1	4.8
Inflation	7.0	3.1
Housing	6.4	4.3
AAA corporate bonds	6.1	2.5
19th century European paintings	15.5	15.6
Chinese ceramics	14.3	37.7
Modern paintings	11.9	11.8
All paintings	10.7	8.2
Impressionist paintings	10.3	7.1
English silver	9.1	13.7
Old Master paintings	8.7	12.7

If we assume that the rate of return on paintings from viewing pleasure is nearly constant over time, equation (2) can be combined with equation (1) and rewritten as:

$$(3) \quad (R^c_{i,t} - R_{f,t}) = \beta_0 + \beta_1(R^c_{m,t} - R_{f,t}).$$

The intuition behind equation (3) is the same as equation (1), except for the constant term, β_0, which represents any superior return (or systematic deviation) from what would be predicted by the asset's relative systematic risk, less the expected return in art viewing pleasure, R^c_c. For goods that yield no consumption services and that operate in an efficient market with no transactions costs or taxes, β_0, will be near zero.[4]

Unfortunately, this simple CAPM model is mis-specified under conditions of uncertain inflation where the inflation hedging characteristics of the asset in question deviates from that of the market basket.[5]

It can easily be shown that under conditions of price uncertainty, differences between the nominal rate of return of an asset and what was expected ($R_t - R^e_t$) are equal to the difference between that asset's real rate of return from what was expected ($r_t - r^e_t$) and errors in inflation expectations ($P_t - P^e_t$), or:

$$(4) \quad (R_t - R^e_t) = (r_t - r^e_t) + (P_t - P^e_t).$$

Notice that when nominal rates of return are fixed, errors in inflation expectations generate errors in expected real asset returns.[6] Alternatively, where assets are hedged against inflation — that is, where errors in inflation are incorporated completely into nominal asset premiums — the real rate of return for the asset is fixed.

To adjust for uncertain inflation in the CAPM, this study employs the specification:

$$(5) \quad R_t - R^e_t = b(P_t - P^e_t) + v_t,$$

where b represents the degree to which asset returns are hedged against inflation, and v_t is a normally distributed error term with a mean zero and a constant variance. A $b = 1$ implies that the real return on the asset is unaffected by inflation forecasting errors (that is, the asset is a perfect hedge against inflation). A $b = 0$ implies the rate of return on the asset is completely exposed to inflation forecasting errors, or the asset is "unhedged."

Combining equation (3) with (5) gives a CAPM under conditions of price uncertainty (CAPMUI) in the form of equation (6):

$$(6) \quad R_{i,t} - R_{f,t} = \beta_0 + \beta_1(R_{m,t} - R_{f,t}) + \beta_2(P_t - P^e_t) + \epsilon_t,$$

where

$$\beta_2 = b_i - (b_m)(\beta_1),$$

and

$$R_{i,t} - R^e_{i,t} = b_i(P_t - P^e_t),$$

$$R_{m,t} - R^e_{m,t} = b_m(P_t - P^e_t).$$

Using the actual consumer price performance over the year less expected consumer price increases, equation (6) was estimated annually over the 1971–1984 period.[7] The return on the market portfolio reflects a weighted average of the return from stocks, bonds, and real estate. The risk-free rate of return is represented by the one-year yield on U.S. Treasury securities held until maturity. A dummy variable was included to capture special influences that occurred in the art market, namely proposed changes in British taxation rules involving art and the U.S. legalization of private gold ownership, which jointly severely depressed fine art prices in 1975. The estimation results are reproduced in table 3.

Under this CAPMUI specification, paintings were found to be a moderately risky investment when compared against the yield on a diversified market portfolio (although not significantly so), since the relative systematic risk of paintings was found to be slightly greater than 1 ($\beta_1 = 1.15$).

Within the paintings market basket, individual painting periods generated different results. The return on Old Masters paint-

4. Stein (1977, p. 1,029) has argued earlier that any positive annualized premiums to account for the tax advantages of art and negative premiums to account for illiquidity should be small because of the relatively long holding period of paintings. Further, these two, influences will tend to cancel one another.

5. See Lawler (1978). Since data on expected nominal return rates are unobserved, the standard CAPM is estimable using the assumption that expected rates of return deviate from actual rates of return by a random, normally distributed error with a mean ϵ_t of zero, or:

$$R^e_t = R_t + \epsilon_t.$$

During periods of uncertain inflation, when hedging characteristics vary across assets, this assumption is violated, as errors in expectations may not be random. For a good discussion of the standard assumptions used in deriving and applying the standard CAPM, see Niagorniak (1972).

6. See Kantor (1983, p. 28).

7. The expected inflation values were obtained from the University of Michigan's Survey of Consumer Attitudes (1984).

ings was found to have a relatively large risk factor ($\beta_1 = 1.34$), compared against the more co servative return on Impressionist and Post-Impressionist paintings ($\beta_1 = 0.97$). Of all the components tested. Modern art registered the least systematic risk ($\beta_1 = 0.92$). while Nineteenth Century European drawings and paintings showed the greatest risk factor ($\beta_1 = 1.54$).

The price expectation error coefficients. β_2, give an indication of the impact of uncertain inflation on the asset. The inflation-hedging ability of paintings, relative to the market basket, depends on the sizes of b_i and b_m. Knowledge of β_1 and β_2 enables inferences about b_i and b_m to be drawn.

In all cases, the results strongly suggest that the inflation-hedging ability of paintings was superior to that of the market basket tested. However, the pure inflation-hedging ability of the asset (b_i) is not econometrically identified. If we assume that $b_m = 0$; that is, the total portfolio is unhedged against inflation, the point estimate of the inflation-hedging strength of the paintings market. b_i, is greater than 1 ($b_i = 1.76$). This result implies that paintings returns are completely hedged against uncertain inflation? The constant terms, which includeany superior return over the 1971–1984 period, less the return in art viewing services, were all positive and generally significantly different than zero.

From this result, we can infer that over the period of analysis, the returns in the art market were lucrative for the pure art speculator.[10] The largest superior returns were found in the market for Nineteenth Century European drawings and paintings, with a nonsystematic return coefficient of 7.2 percent.

Of the individual art categories tested using this CAPMUI specification, the capital asset pricing model fit best for Modern paintings ($R^2 = 0.80$), an indication that this particular market most closely resembles a standard investment market over the sample period. while a market such as Nineteenth Century and Old Masters paintings was only weakly approximated by this investment behavior specification."

It should be noted that as the art market becomes more disaggregated, the ability to model its behavior accurately becomes more difficult, because the actions of a small circle of investors can influence price patterns. For example, the rather dramatic volatility in Nineteenth Century paintings prices may, in part, be explained by a few investors driving up the prices of particular artists or even specific works and may not be an accurate appraisal of the market for other Nineteenth Century types.

Conversely, the conservative nature of the Impressionist and Post-Impressionist paintings market may reflect greater product homogeneity, which is to say that this market may have a relatively wide appeal. Consequently, individual buyers are probably less influential in the marketplace for Impressionist and post-Impressionist paintings.

The results found in this analysis are largely consistent with the earlier studies, with one notable exception: fine paintings prices yielded superior returns for the pure art speculator.

Over the extended horizon of 1780 to 1970, the risk-adjusted return on paintings was estimated by Anderson (1972) to be superior only for the art lover. The art investment return over this 190-year period was only 50 percent of that earned on common stock. Stein, on whose original work this project is based, found that over the period 1946–1968 the investment return on paintings provided only about 73 percent of the return earned on common stock. In our current analysis, the rate of return on a paintings basket exceeded that earned by stocks by approximately 30 percent.

8. Ideally, the market portfolio should include all assets available for private ownership. Because of weighting difficulties, some assets that may be considered components of household wealth, such as gold and farm land, were excluded from the market return calculations.

9. Other assumptions regarding b_m would yield different interpretations of the inflation-hedging strength of the paintings market. Some studies—Nelson (1976), Bodie (1976), und Jaffe and Mandelker (1976)—suggest that b_m may actually be negatioe. Although a negative b_m would imply a smaller value for b_i, even these extreme estimates were not largeenough to reject the hypothesis that $b_i = 1.00$.

10. It must be noted that a significant intercept term may also reflect the influence of market factors, which are not adequately introduced into this simple specification.

11. Conversations with art curators tend to support this result. Investor interest in the art market may be relatively limited to moderately priced objects.

12. *This analysis is done with apology to the art connoisseur, who may believe that the appreciation of fine art transcends economic valuation.*

13. *A check on art insurance costs uncovered a range of estimates, from a low of 0.14 percent of the object's appraised value to a high of almost 2 percent. For the individual investor with a total art value of over $1,000, insurance was generally under 0.5 percent of the object's appraised value per year.*

IV. A Word on the Consumption Value of Art

An important issue, which is only implied in the CAPM model is the "value" that art provides in viewing pleasure." A check on the value of viewing services can be made through the rental art market, where the art consumer enjoys only the art, and the investment returns accrue to the owner.

Many museums have partially developed rental markets. A few have fully developed markets that-lend objec'ts of fine art to corporations, universities, public offices, and individuals. Unfortunately, the rental market is almost exclusively within the contemporary art market, to which this analysis may not directly apply.

Further, the cost of art: rental is determined by many factors, such as whether the owner or the renter bears the cost of insurance.[13] Moreover, the renter frequently has the option to buy the object, which may distort the true rental return implied by the rents earned in these markets.

For these reasons. the actual rental price of the type of art found in the Sotheby's art basket is unknown. In 1977, Stein set the rental price of paintings at no more than 11 percent of the object's appraised value. More recent estimates of rental costs in the contemporary fine art market, which included the optian to buy. ranged from 17.8 percent to 19.7 percent!.' Compared with the 11.9 percent investment return in the Modern paintings component of-Sotheby's art index (its closest relative) it yielded an approximate service return in the contemporary art market of 6 percent to 8 percent a year between 1971 and 1984.

In one case, a corporate rental program for certain "traditional" Nineteenth and Twentieth Century art works, also with an option to purchase, found an average return of about 29 percent (a.r.). Compared with 'the 15.5 percent investment return by its'closest coun-

Table 3 Capital Asset Pricing Model Regression Results, 1971-1934

$$(R_p - R_f) = \beta_0 + \beta_1(R_m - R_f) + \beta_2(P - P^e) + \beta_3 \text{Dum75} + \epsilon$$

	β_0	β_1	β_2	β_3			
Paintings	0.041 (1.91)[b]	+1.15 (3.00)[a]	+1.76 (1.84)[b]	-0.17 (2.04)[b]	$R^2 = 0.56$	$DW = 1.40$	$F = 4.31$
Old Masters	0.028 (0.70)	+1.34 (1.89)[b]	+1.20 (0.67)	-0.20 (1.32)	$R^2 = 0.31$	$DW = 1.52$	$F = 1.45$
Impressionists	0.036 (2.27)'	+0.97 (3.38)"	+1.34 (1.87)[b]	-0.16 (2.50)[a]	$R^2 = 0.62$	$DW = 1.54$	$F = 5.48$
19th century	0.072 (1.46)	+1.53 (1.75)	+2.84 (1.30)	+0.04 (0.22)	$R^2 = 0.31$	$DW = 1.22$	$F = 1.51$
Modern	0.061 (3.10)[a]	+0.92 (2.64)[a]	+2.70 (3.11)[a]	-0.37 (4.87)[a]	$R^2 = 0.80$	$DW = 1.45$	$F = 13.02$

NOTE: All equations were estimated using ordinary least squares (t-statistics in parentheses).
a. Significant at 5 percent.
b. Significant at 10 percent.

Original Stein Regression (R_m = stock returns), 1946-1968

Paintings	-0.016 (-0.45)	+0.82 (2.30)	$R^2 = 0.24$	$DW = 2.18$

terpart in Sotheby's Art Index (Nineteenth Century European paintings), it yielded a traditional art service return of approximately 13 percent.[15]

Given these rental cost estimates, it appears safe to conclude that during the past 14 years. the art market was a superior investment for those who aiso enjoy the beauty of paintings.

V. Conclusion

This analysis is not intended to serve as a basis' for individual investment decisions. The actual investment performance of any art object depends on events that cannot be accurately reproduced by the simple financial model and short sample period presented here.

Even in the aggregatk, the CAPMUI equation for all paintings showed an R^2 of 0.56, which is to say that this specification only "explains" a little more than 50 percent of the variatidn in paintings prices over the 1971–1984 period.

However, the results of this analysis suggest that, on average, the total paintings index was not measurably more risky than a market portfolio Containing stocks, bonds, and real estate. Moreover, even for the pure art speculator, paintings were generally superior investments (that is, they generated returns in excess of comparable risk) over the test period when compared against the market portfolio proxy.

Of the individual art components studied here, Nineteenth Century drawings and paintings were found to have the greatest systematic risk, and Modern paintings were the most conservative performers. Most importantly, these results demonstrate that nominal paintings returns were relatively more inflation-hedged than the representative market. portfolio, especially Modern paintings.

The degree to which the paintings market is hedged against uncertain inflation is undefined in this model. Yet, if the market basket used here is a good approximation of the complete market portfolio, and if this portfolio's hedging ability is near zero, then these results suggest that paintings are virtually completely inflation-hedged.

Finally. given only limited information on returns in the rental art market, this analysis was also unable to determine conclusiveiy the magnitude of the consumption returns from art. However, we can conservatively guess that art lovers enjoyed very sizable returns from owning paintings due to the additional consumption service they provided.

Data Appendix

Annual rates of return were calculated on a third-quarter to third-quarter basis, because the Sotheby's index was computed only during September between 1967 and 1981. After 1981, the Sotheby's index is available monthly. Compounded rates of return were estimated by using natural logarithms.

The data used in this analysis were:

Bonds
AAA Corporate Yield from Moody's.

Stocks
The stock return estimates were approximated using price changes and dividends from 500 stocks as calculated by Standard and Poors.

Gold
Gold prices were found using the CPI retail price per troy ounce.

Housing
Housing prices were estimated using the CPI-W home purchase price component.

P
The rate of inflation estimateused in this study was the Consumer Price Index for all urban consumers (CPIU).

P^e
The price expectations data used in this analysis are average consumer price increase expectations over the next 12 months, obtained from the University of Michigan Institute for Social Research, *Surveys* of Consumer *Attitudes*, September 1984.

14. The contemporary urt market was defined as art produced by living artists. and traditional art was defined us that producted by artists no longer alive.

15. For corporate borrowers, fhe range of fhoscexercising the buying option was between 25 and 33 percent, given a sample of five rental programs. The programs considered were the Philadelphia Museum of Art (Philadelphia. PA). Chicago Art Institute (Chicago. IL), Kansas City Art Museum (Kansas City, MO), the Newport Harbour Museum of Art, (Newport Harbour. CA), and the Fogg Art Museum (Cambridge. MA).

R_f
The risk-free rate of return is represented by the one-year rate of return on new-issue U.S. Treasury bonds held until maturity.

R_m
The return on the market portfolio was calculated using a weighted average of housing, bonds, and stock market returns. The weights applied came from the asset's share of outstanding household net worth normalized to 1.

R_t^*
The Sotheby's Index is available monthly in *Barron's*. For a complgte explanation of the construction of the index.. see "Unveiling Sotheby's Art Index," *Barron's*, November 4, 1981; and "The Sotheby's Index: What's In It?" *Barron's*, February 15, 1982.

Elasticity estimates
The constant elasticity estimates for paintings prices (P_p) were estimated annually over the 1970–1984 period using the log-transformed regression:

$$\ln P_p = -9.85 + \underset{(4.19)}{0.96 \ln P} + \underset{(2.22)}{1.35 \text{ In Real } GNP} + \underset{(1.70)}{0.30 \text{ RHO}}$$

$R^2 = 0.96$, DW = 1.58
(t-statistics in parentheses)

References

Anderson, Robert C. "Paintings as an Investment:' Economic Inquiry, vol. 12, no. 1 (March 1974). pp. 13–26.

Ang, James S.. Jess H. Chua, and Walter J. Reinhart. "Monetary Appreciation and Inflation-Hedging Characteristics of Comic Books:' *The* Financial Review. 1983. pp. 196–205.

Black, Fischer. Michael C. Jensen, and Myron Scholes. "The Capital Asset Pricing Model: Some Empirical Tests:' in Michael C. Jenson. ed.. *Studies in the Theory of* Capital *Markets*. New York: Praeger Publishers. 1972. pp. 79–121.

Bodie, Zvi. "Common Stocks as a Hedge Against Inflation," *The Journal of Finance*, vol. 31, no. 2 (May 1976), pp. 459–70.

Jaffe. Jeffrey F., and Gershon Mandelker. "The Fisher Effect for Risky Assets: An Empirical Investigation:' *The Journal of Finance*, vol. 31, no. 2 (May 1976), pp. 447–58.

Kantor, Laurence G. "Inflation Uncertainty and Inflation Hedging:' Economic *Review*, Federal Reserve Bank of Kansas City (September–October 1983), pp, 24–37.

Lawler, Thomas A.. "Uncertain Inflation, Systematic Risk, and the Capital Asset Pricing Model:' Working Paper Series 78-2. Federal Reserve Bank of Richmond (February 1978), pp.1–5.

Nagorniak, John J. "The Application of the Capital Asset Pricing Model to Debt and Equity Markets:' in Giorgio P. Szego and Karl Shell, eds., *Mathematical Methods* in *Investment and* Finance. Amsterdam: North Holland Publishing Company, 1972. pp. 344–66.

Nelson, Charles R. "Inflation and Rates of Return on Common Stocks:' The *Journal* of Finance, vol. 3!, no. 2 (May 1976), pp. 471–83.

Singer, Leslie. "Microeconomics of the Art Market," *Journal* of Cultural *Economics*, 1974, pp. 21–30.

Stein, John Picard. "The Monetary Appreciation of Paintings," *Journal of* Political *Econ*omy, vol. 85, no. 5 (1977), pp. 1.021–35.

University of Michigan, Survey Research Center. Surveys of Consumer Attitudes, Institute for Social Research, September 1984.